An Update on the Midcontinent Interactive Digital Carbon Atlas and Relational dataBase (MIDCARB) and its Future

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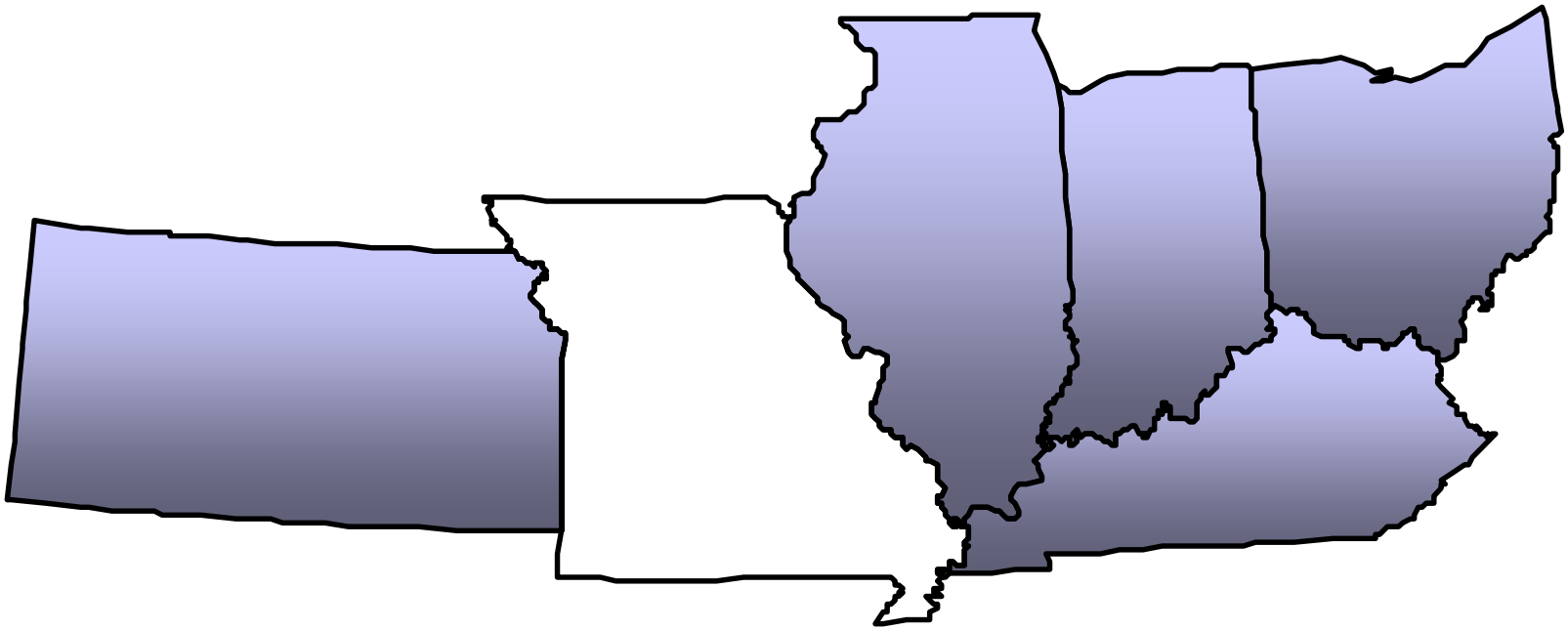
www.midcarb.org

MIDCARB



ABSTRACT: MIDCARB is a multi-state consortium (Indiana, Illinois, Kansas, Kentucky, Ohio), which has constructed an online distributed Relational Database Management System and Geographic Information System for analyzing the spatial relationship and technical characteristics of large point sources of CO_2 and geologic sequestration options (http://www.midcarb.org).

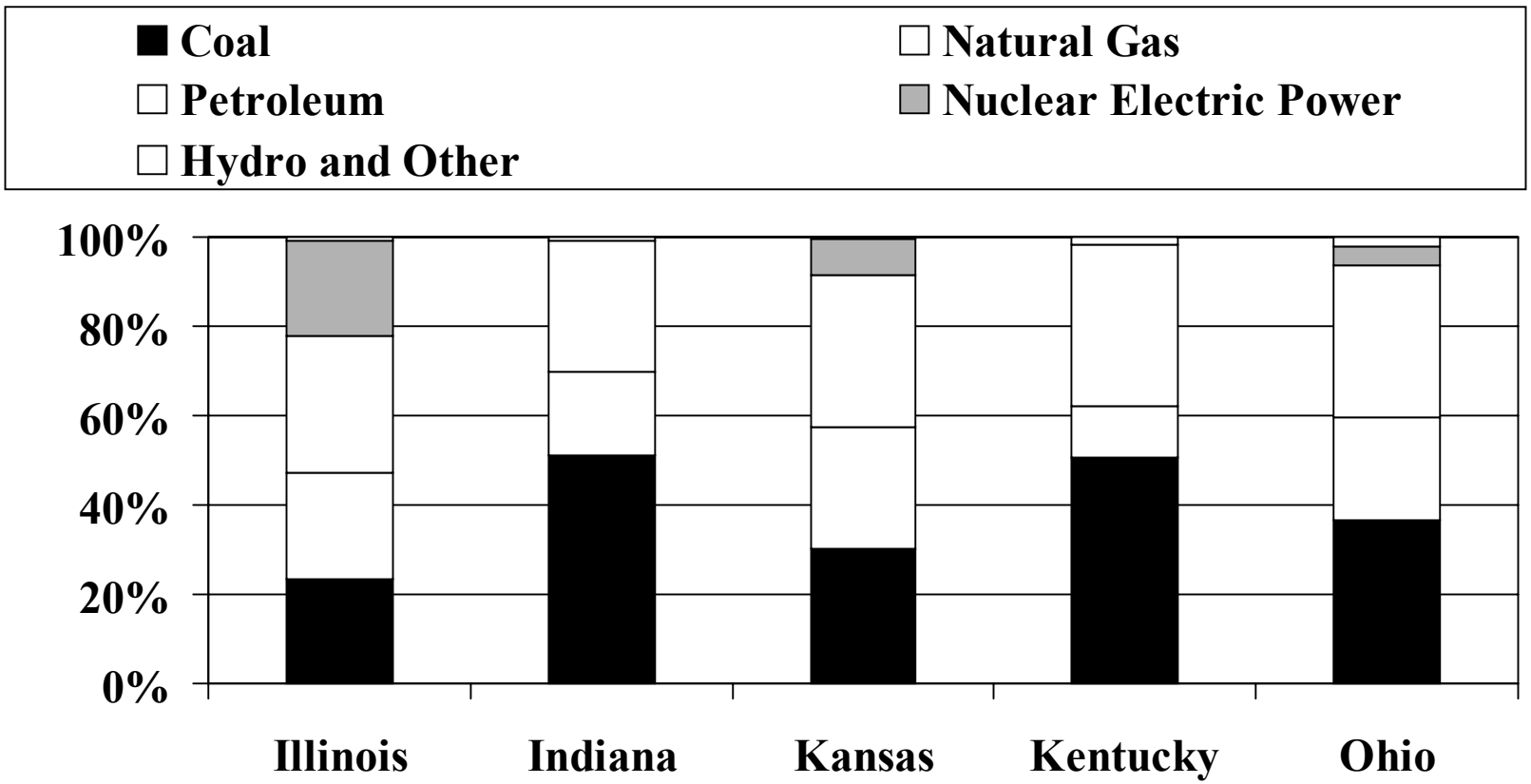
MIDCARB provides advanced distributed computing solutions that dynamically link database servers across each state allowing data to be maintained at the local level but accessed through a single web portal. The consortium intends to expand the study by adding additional states and increase the expertise available to assess the geologic sequestration potential.

Program Participants:

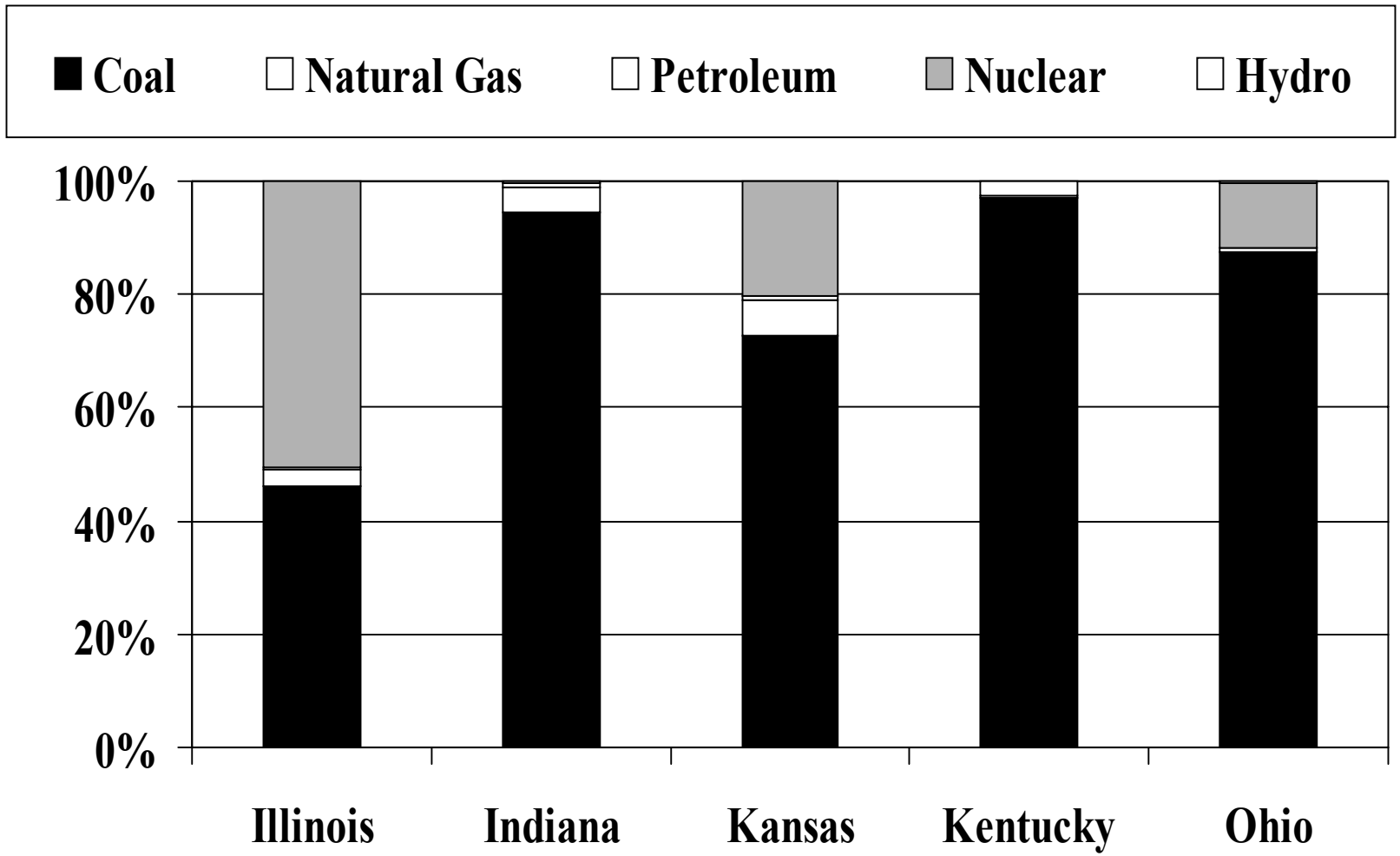
KGS

NETL

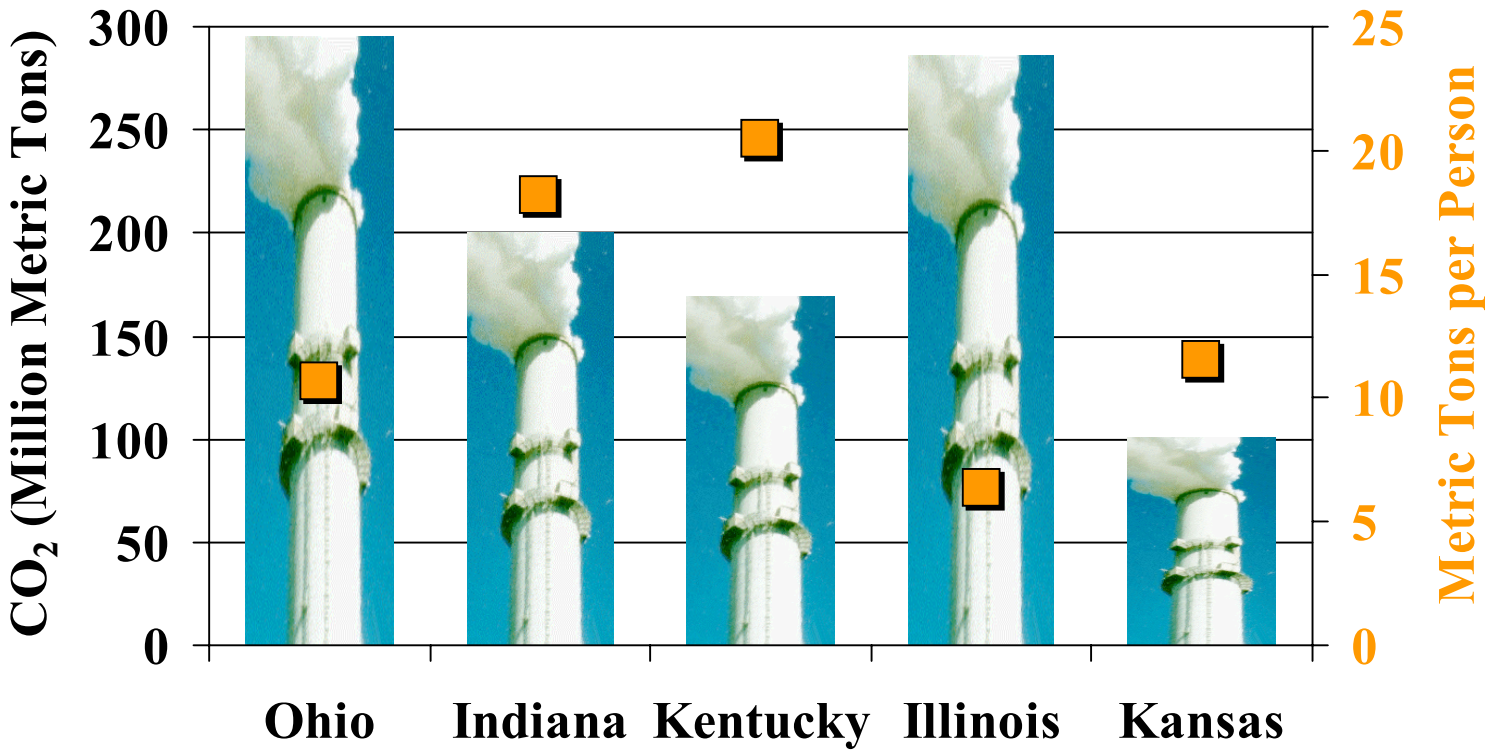
The Total Energy Mix in Each State Varies Widely



Fuel Mix for Electricity Production Varies Widely in MIDCARB States



CO_2 Emissions in MIDCARB States varies by state and per person average.



2000 US Census Bureau and 2000 DOE/EIA data

The MIDCARB states have solid fossil energy industries with varying production amounts in each state.

	Coal	Natural Gas	Petroleum
State	**Thousand Short Tons**	**Million Cubic Feet**	**Thousand Barrels**
Illinois	33,783	185	10,092
Indiana	36,738	1,064	2,022
Kansas	176	481,445	33,942
Kentucky	133,834	81,723	2,970
Ohio	25,400	100,107	6,050

Carbon Management Data Online

- Data is Maintained at Local Level
  - Current
  - Detailed
  - Accurate
- Online Access
  - Users Driven
  - Flexible Query and Display
  - Access to Products and Data

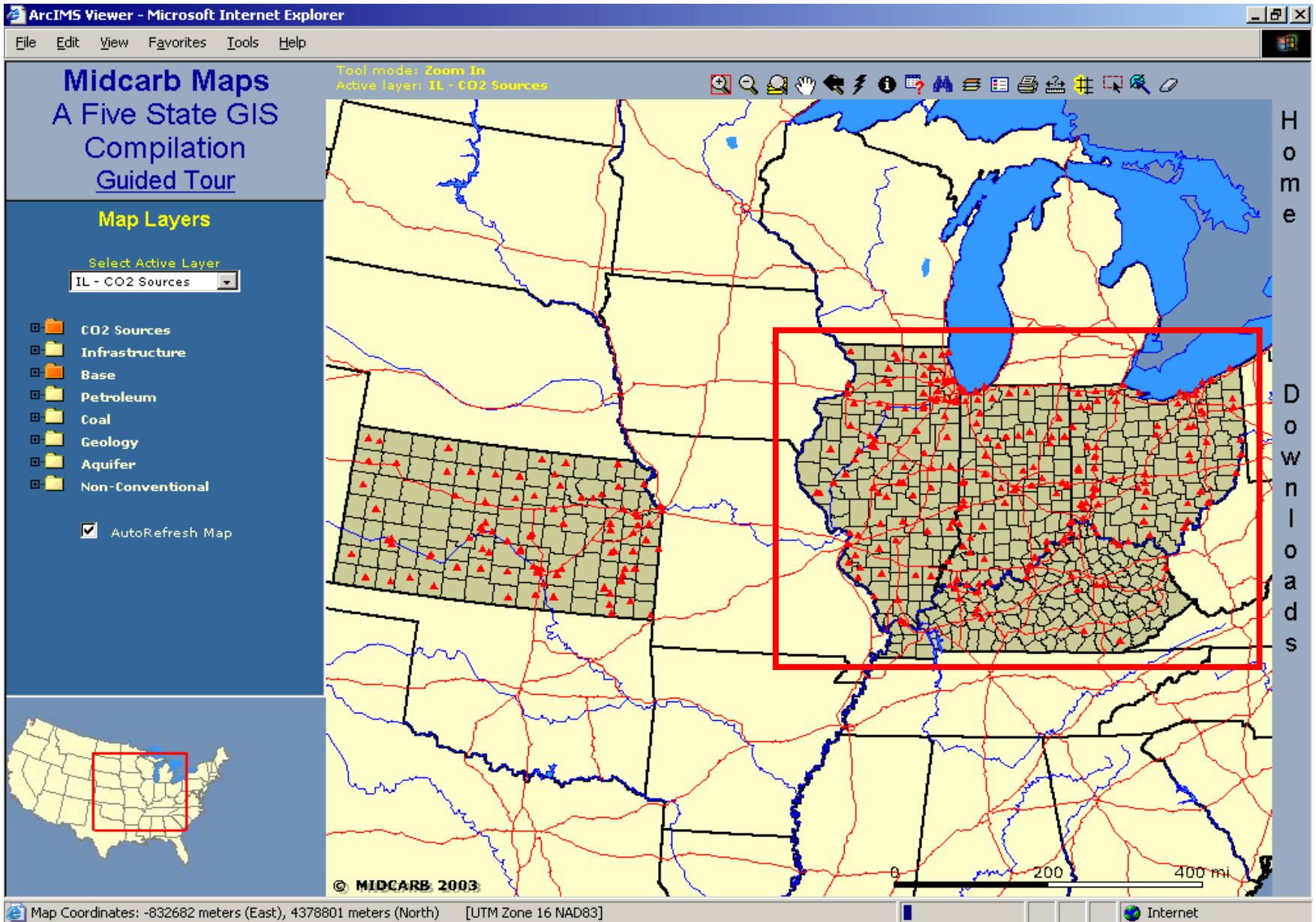
Industrial Sources of CO_2

- Power Plants – Coal, Oil and Natural Gas
- Ethanol Plants
- Cement Plants
- Fertilizer Plants
- Solid Waste Landfills
- Other industrial plants that burn fossil fuels

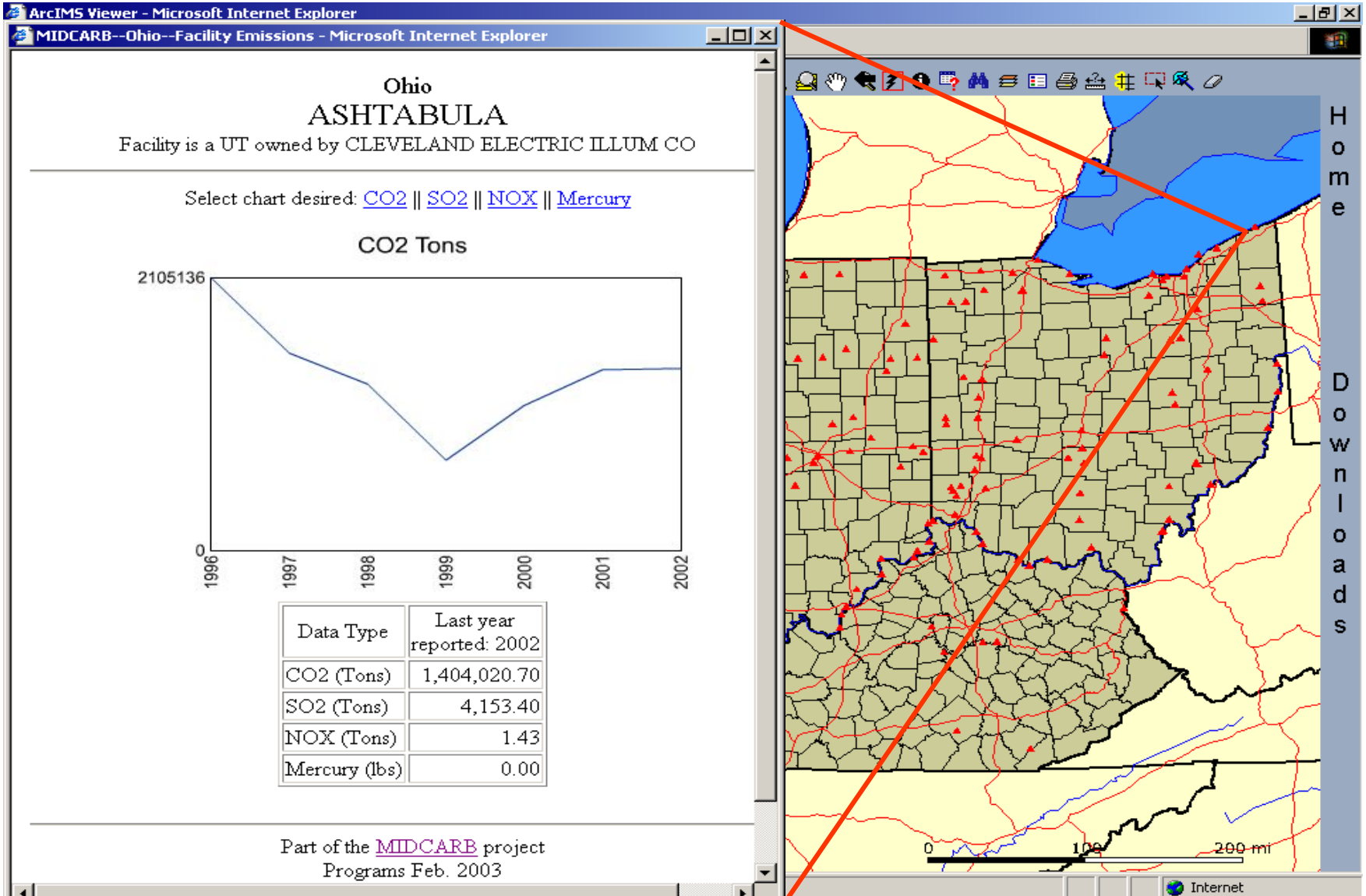
Geologic Sequestration Potential

- Active and Depleted Oil and Gas Reservoirs
  - Value-Added Sequestration from High Quality Sources
    - Dubois and others (This Conference)
- Saline Aquifers
- Deep and non-economical Coal Beds
  - Value-Added Sequestration
- Unconventional Gas Reservoirs
  - Devonian Black Shale
  - Tight gas sands

The MIDCARB mapping interface has tools familiar to most GIS users.



Annual emissions info on specific power plants and various emission types, can be displayed and graphed.



MIDCARB has successfully linked tabular databases from the five cooperating states using a Web application development tool called ColdFusion. Recently purchased by Macromedia, formerly owned by Alliare, ColdFusion provides the developer with a custom set of html (CFML) tags that allow the developer to easily interact with databases to build dynamic Web pages.

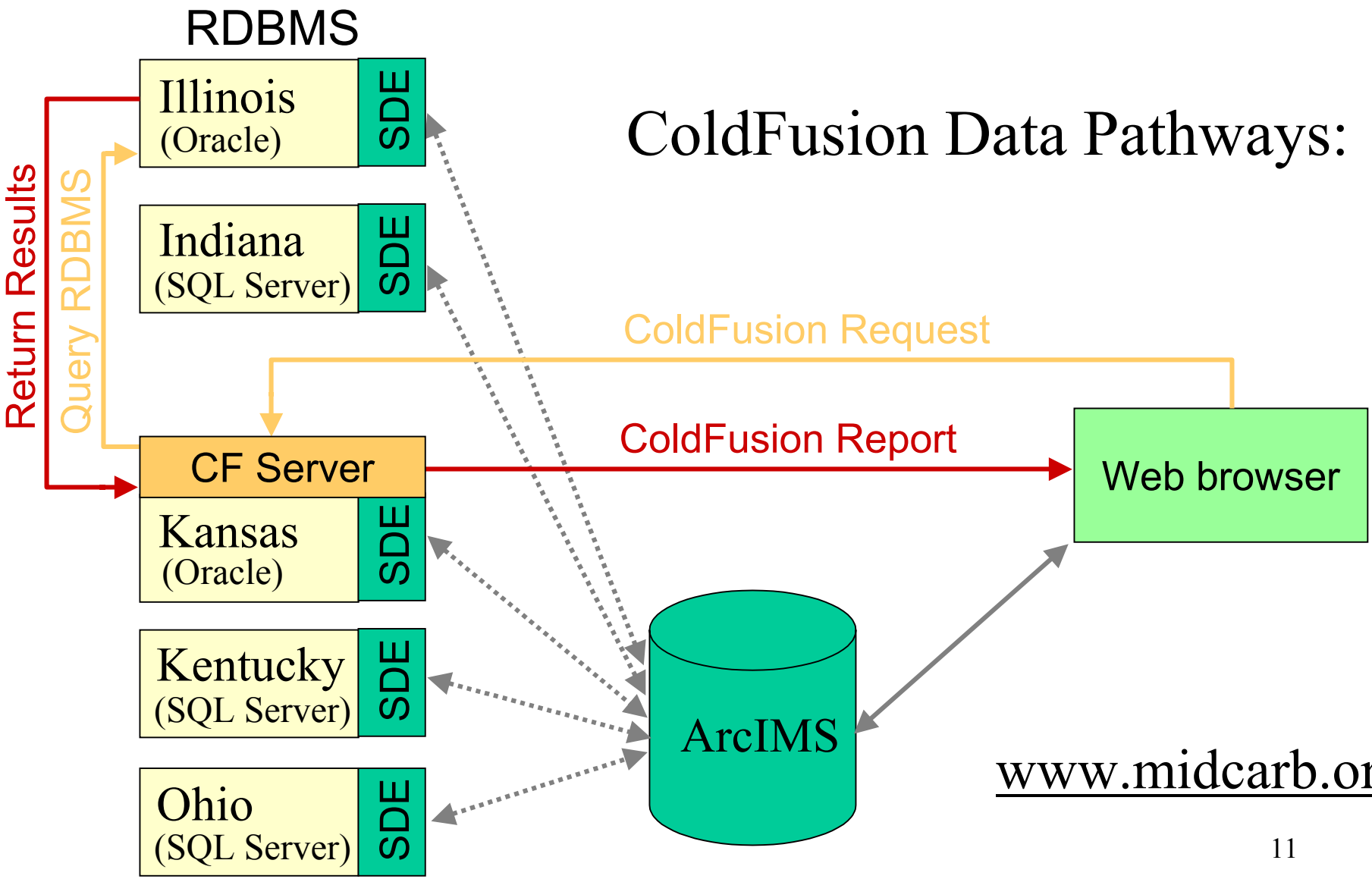
The first report on the previous slide is generated dynamically using a ColdFusion report.

The diagram on the next slide shows how requests from the Web browser, in this case initiated by clicking on a power plant with the hotlink tool, travel back to the ColdFusion server in Kansas.

The ColdFusion server then queries appropriate databases, in this case the Ohio Oracle database.

Results of the query are returned to the ColdFusion server in Kansas and then delivered as a pure html report to the Web browser.

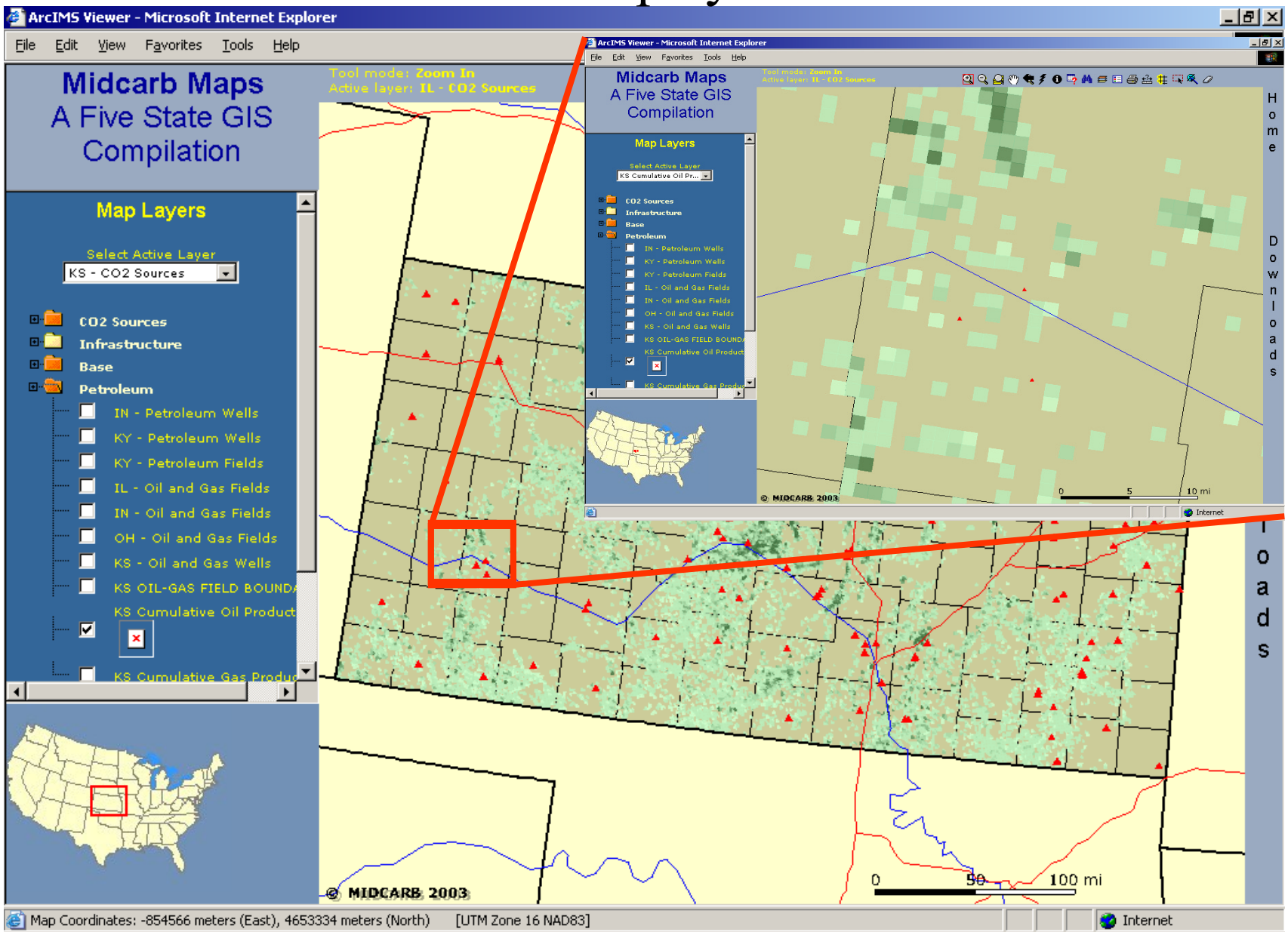
Data Integration



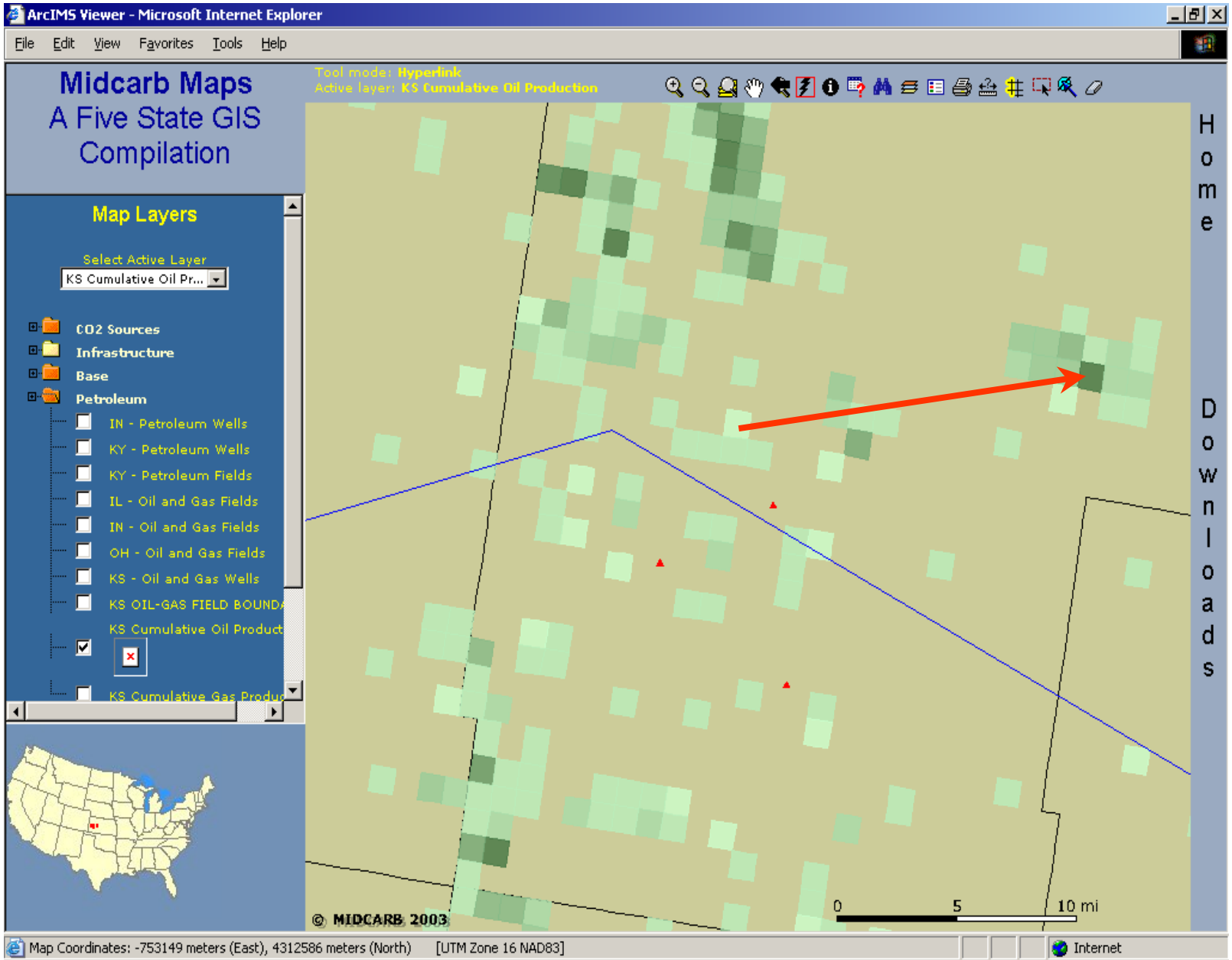
ColdFusion Data Pathways:

www.midcarb.org

A variety of data on specific oil fields can be accessed and displayed.



Greater detail on individual fields is possible…

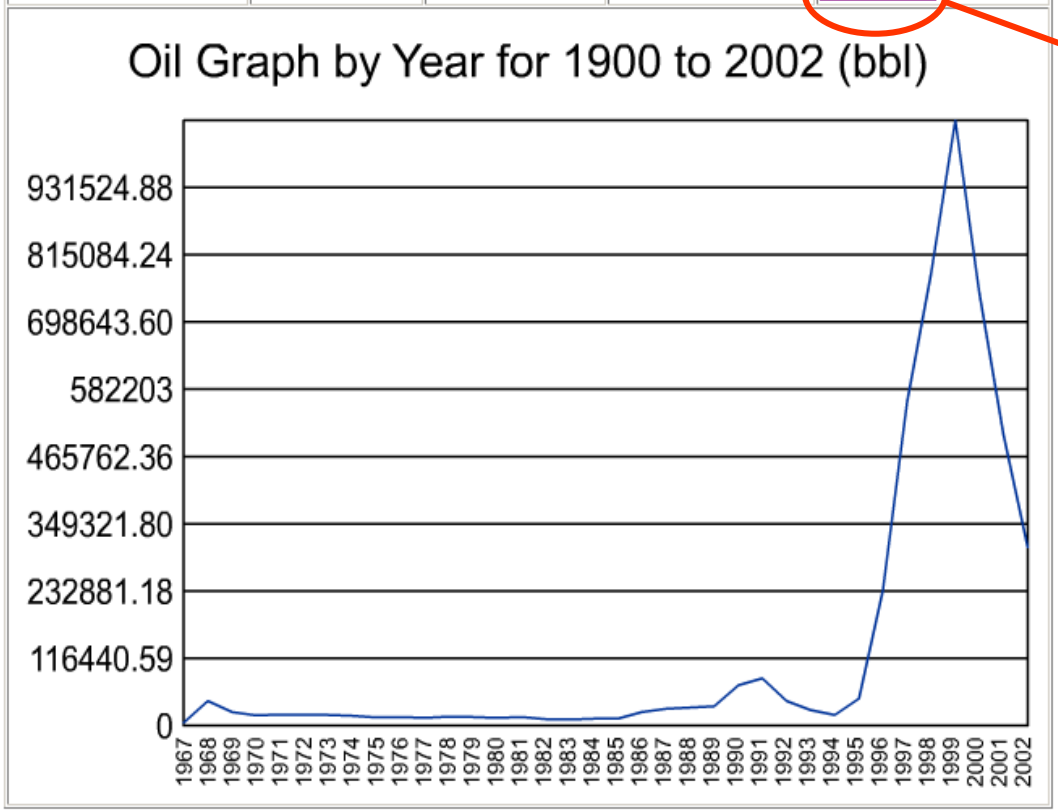


…showing cumulative production, and even summaries of field production.

Section Details - Microsoft Internet Explorer

Legal Location Information for 23S31W12

Field Name	Produces Oil	Produces Gas	Section Coverage	Detailed Information
HUGOTON GAS AREA	Yes	Yes	ALL	Field Summary
STEWART	Yes	No	N2 & W2	Field Summary



Stewart--Oil and Gas Production - Microsoft Internet Explorer

Kansas Geological Survey | Oil and Gas | Field Oil & Gas Production

Stewart--Oil and Gas Production

Discoveries currently listed:

	Operator: CRA **Lease:** Stewart, Well 1 **Location:** 23S-30W: NE SW NW 6 **Discovery Date:** 10/07/1952 **Producing zone:** Miss Oil	**Operator:** Davidor and Davidor **Lease:** Hagg Est, Well 1 **Location:** 23S-31W: NE NE 12 **Discovery Date:** 10/04/1967 **Producing zone:** Mrw Oil

Counties: Finney
Leases: View list of leases for this field
Producing Formations

Name	Depth (ft.)	Thickness (ft.)	Oil Grav	Produces	Temperature
MISSISSIPPIAN	4710	-	28	Oil	120
MORROWAN	4753	12	-	Oil	120

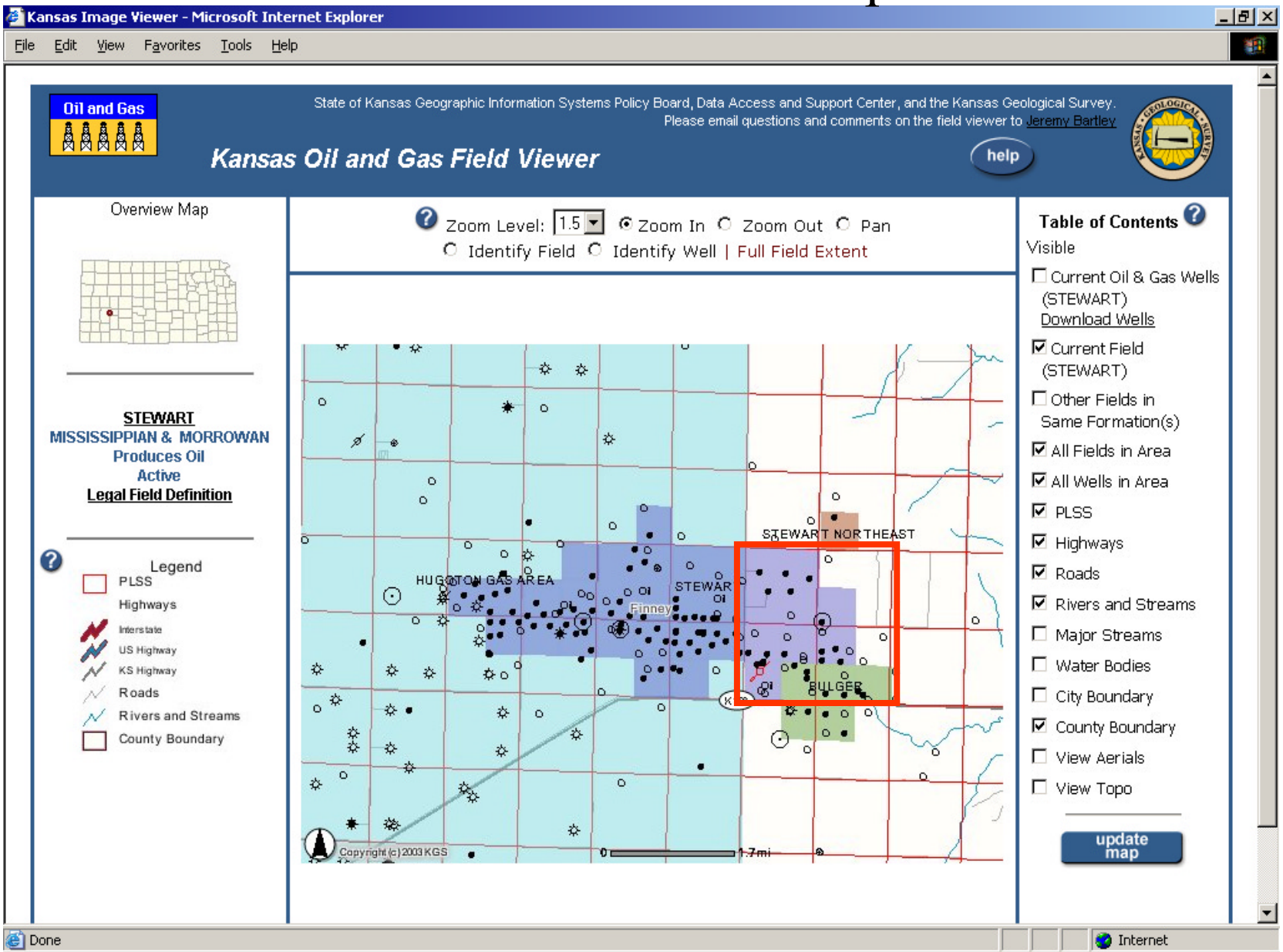
Field Map (opens in new window): View Field Map
Field map is presented as an interactive ArcView map.
This system is under development and may not work with all fields.

View production charts

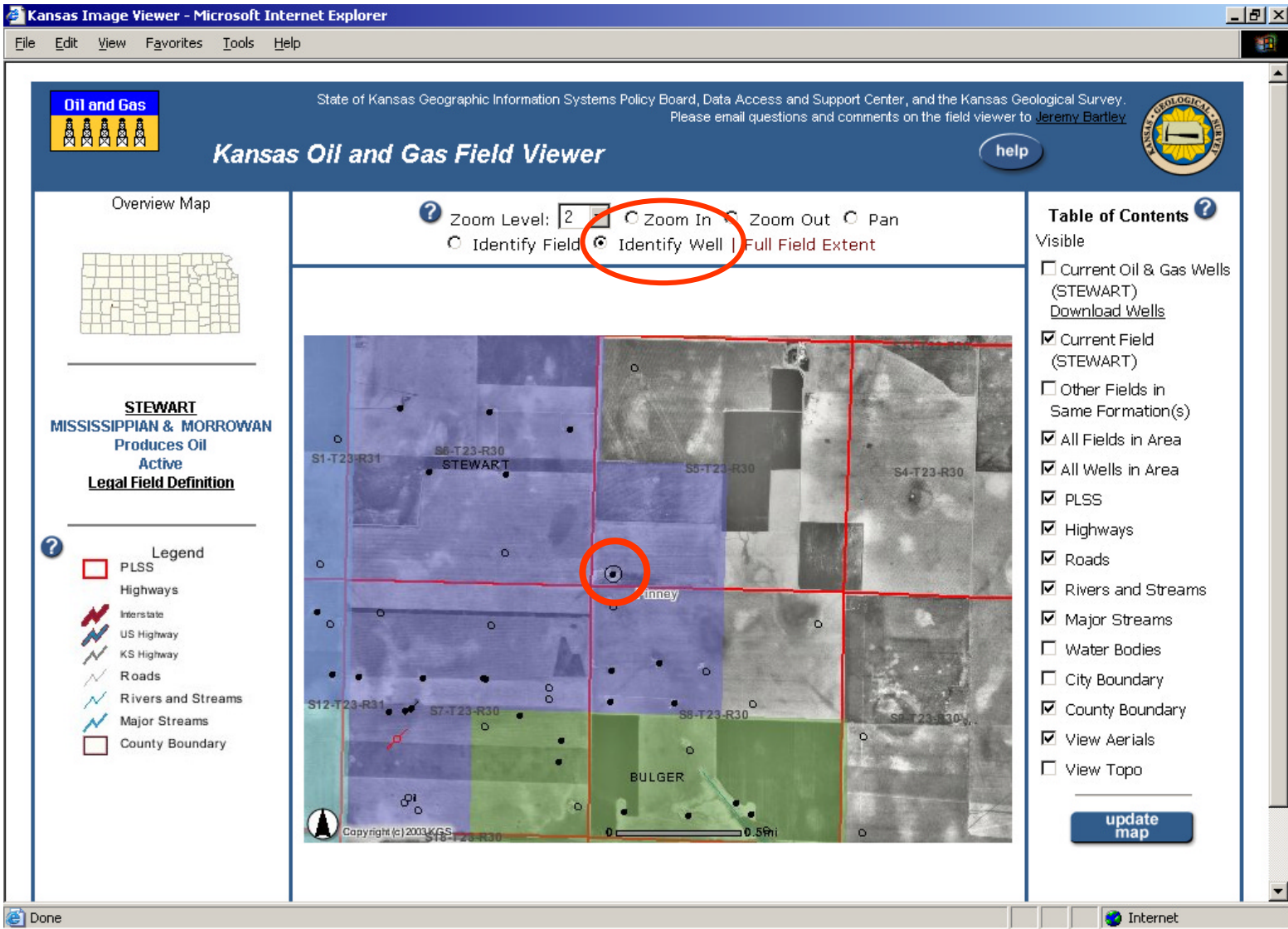
Year	Oil		
	Production (bbls)	Wells	Cu
1966	1,565	1	48

By clicking on the "View Field Map" button, the user will be taken out of MIDCARB to other maps.

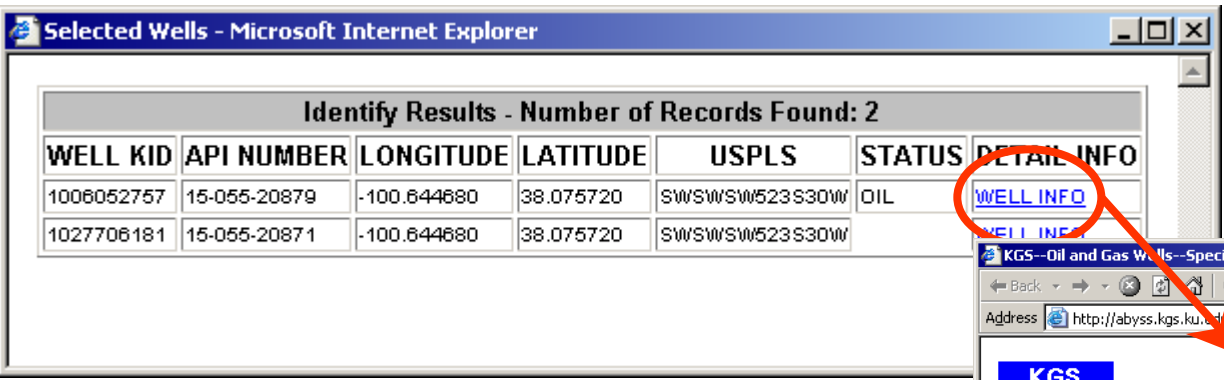
This map shows all wells in the selected area and allows the user to view aerial photos.

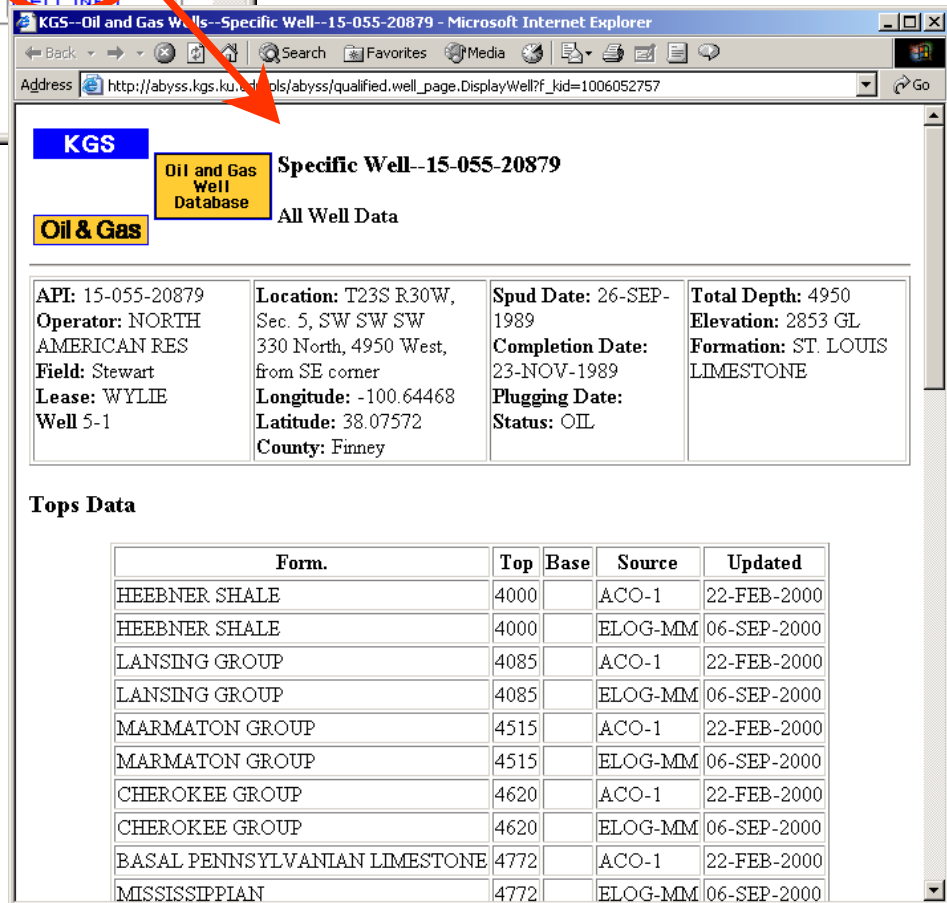


With the aerial photographs, the user can even go one step further and access data about a specific well.



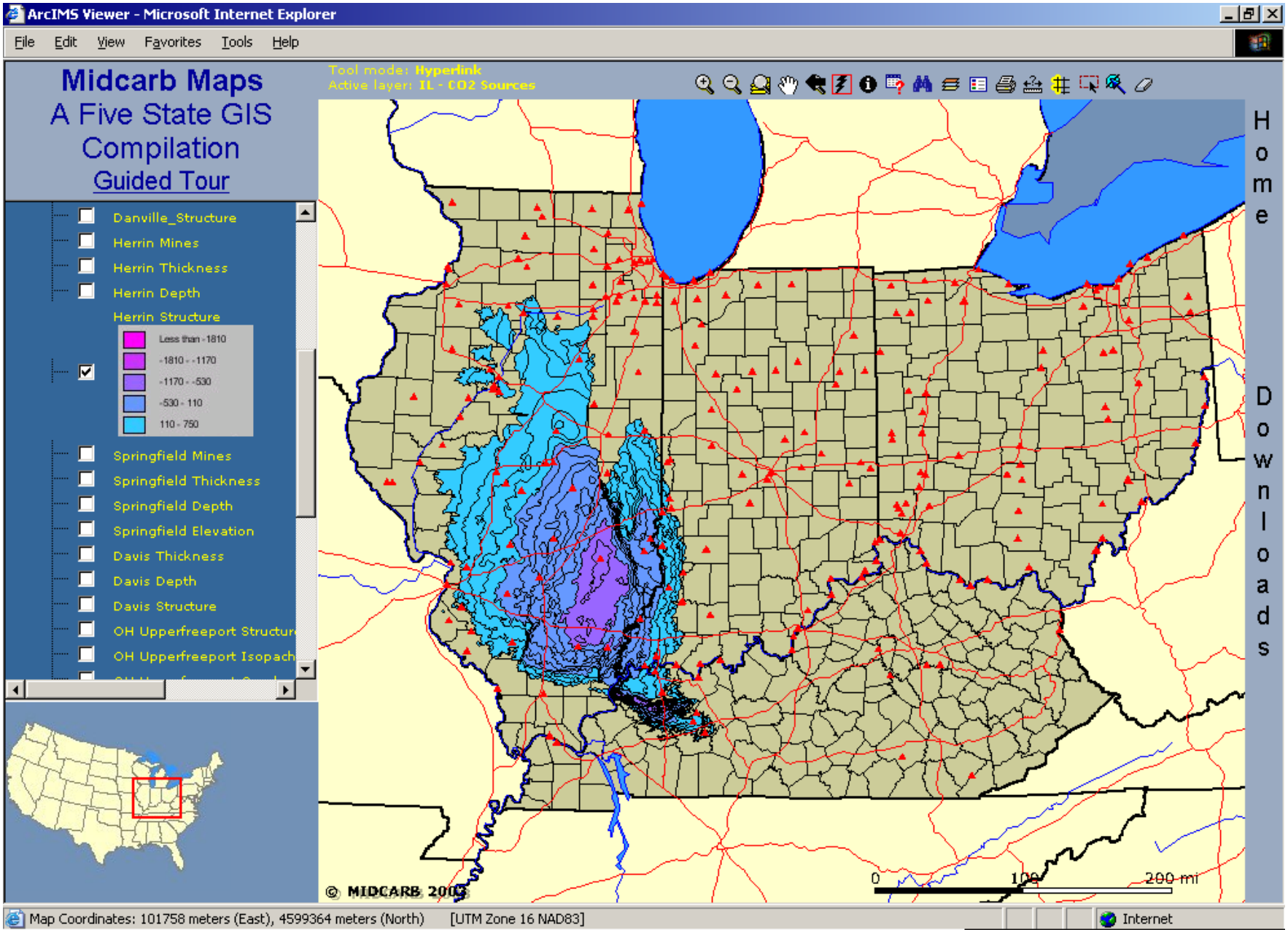
More well data.



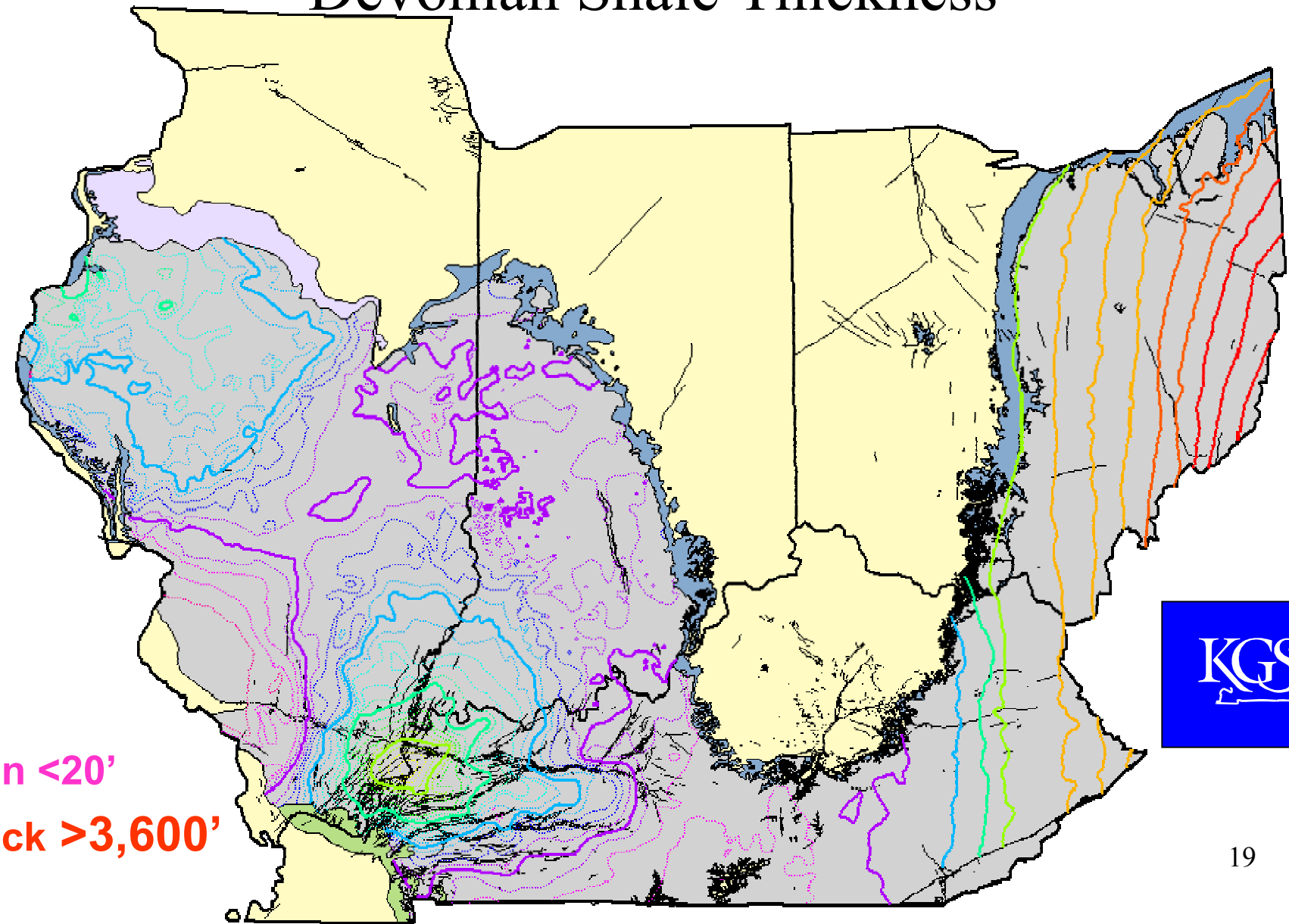


After identifying the well, the user can then access specific information on it, including when it was completed, who owns and operates the lease.

Coalbed Structure Over Multiple States: Herrin



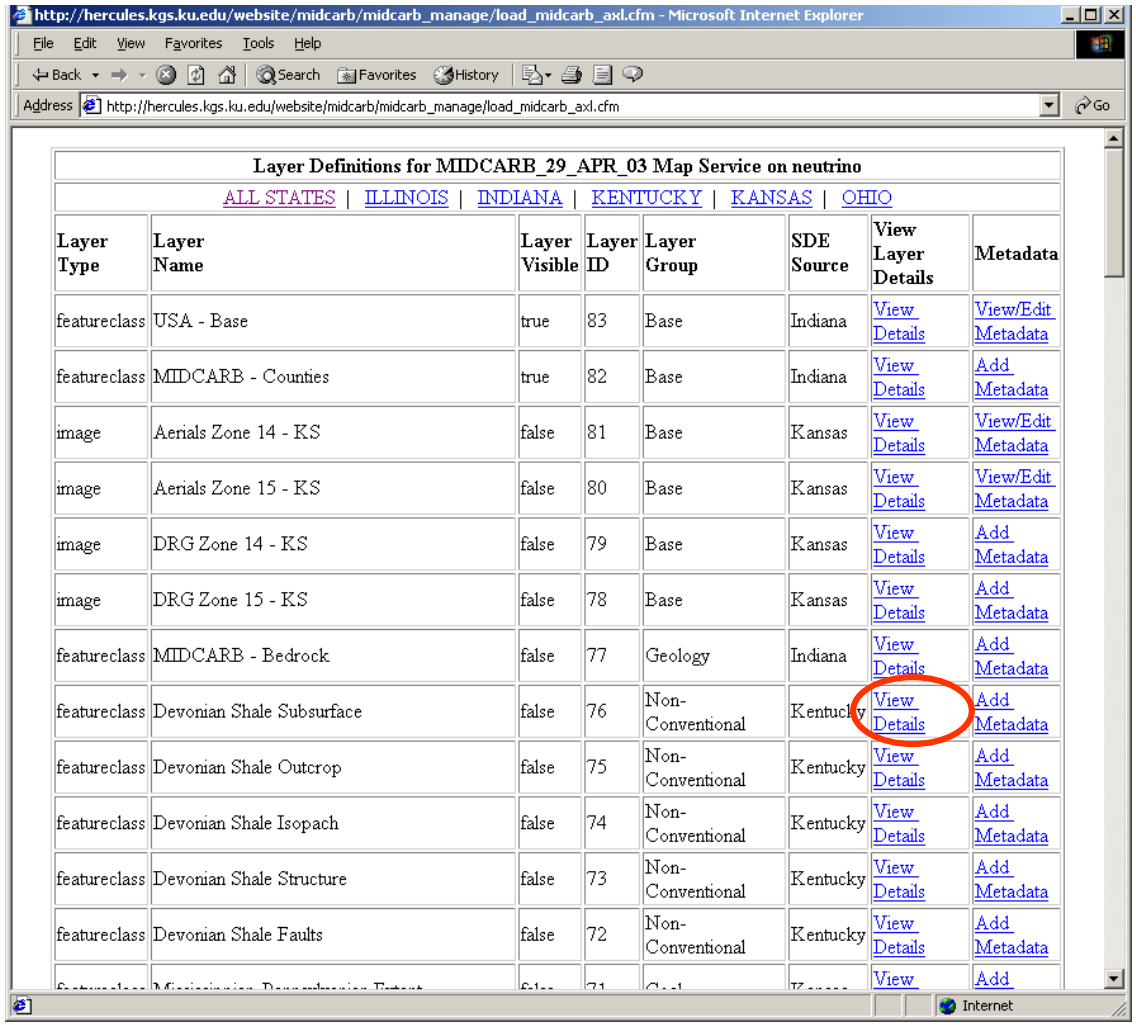
Unconventional Reservoir: Mississippian-Devonian Shale Thickness



Thin <20’

Thick >3,600’

Distributed Management



Layer Definitions for MIDCARB_29_APR_03 Map Service on neutrino

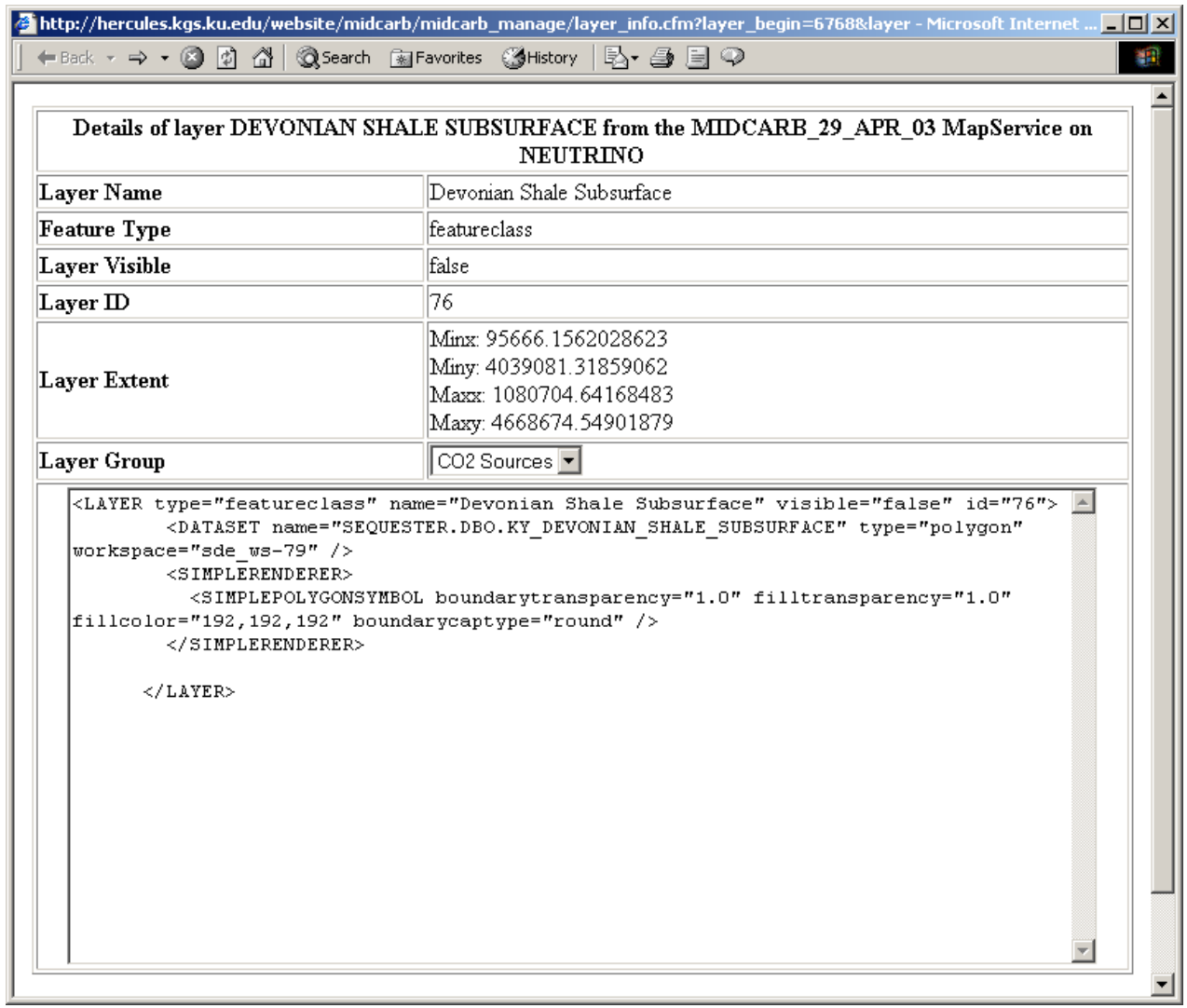
ALL STATES | ILLINOIS | INDIANA | KENTUCKY | KANSAS | OHIO

Layer Type	Layer Name	Layer Visible	Layer ID	Layer Group	SDE Source	View Layer Details	Metadata
featureclass	USA - Base	true	83	Base	Indiana	View Details	View/Edit Metadata
featureclass	MIDCARB - Counties	true	82	Base	Indiana	View Details	Add Metadata
image	Aerials Zone 14 - KS	false	81	Base	Kansas	View Details	View/Edit Metadata
image	Aerials Zone 15 - KS	false	80	Base	Kansas	View Details	View/Edit Metadata
image	DRG Zone 14 - KS	false	79	Base	Kansas	View Details	Add Metadata
image	DRG Zone 15 - KS	false	78	Base	Kansas	View Details	Add Metadata
featureclass	MIDCARB - Bedrock	false	77	Geology	Indiana	View Details	Add Metadata
featureclass	Devonian Shale Subsurface	false	76	Non-Conventional	Kentucky	View Details	Add Metadata
featureclass	Devonian Shale Outcrop	false	75	Non-Conventional	Kentucky	View Details	Add Metadata
featureclass	Devonian Shale Isopach	false	74	Non-Conventional	Kentucky	View Details	Add Metadata
featureclass	Devonian Shale Structure	false	73	Non-Conventional	Kentucky	View Details	Add Metadata
featureclass	Devonian Shale Faults	false	72	Non-Conventional	Kentucky	View Details	Add Metadata

Because of the distributed nature of this project, it has been set up so that data managers from any of the institutions can load data layers and edit how and where they will be displayed.

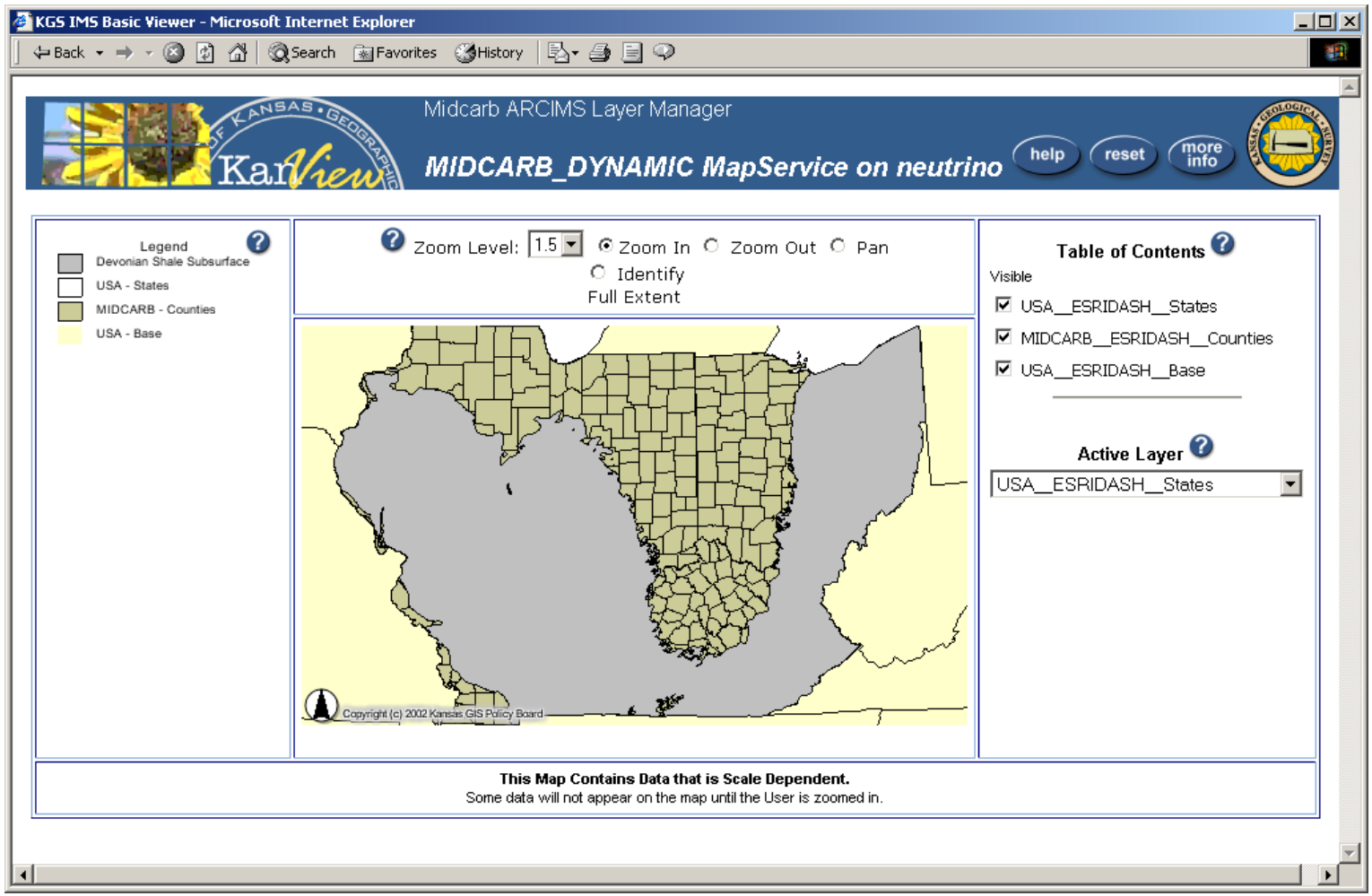
Shown here are the names and types of layers and where these layers are housed. A data manager can click on the "view details" link to see the details of any layer.

Details of an XML layer



Data Managers can then view and/or edit the XML details of how this layer will be displayed (colors, projection, limits, etc.).

View edited changes



After changes are made, the data manager can view how the changes will appear to users of the mapping service.

This system allows the project to take advantage of the experts at every member institution rather than those at just one.

Future of MIDCARB

- Improve Data and Coverages
- Move to support:
  - Open GIS Consortium/Web Map Service (OGC/WMS)
  - XML and other open access tools
- Improved Distributed Management Tools
  - Multiple Servers (Hand-Off to Local Server)
- Modify the current MIDCARB Internet Map Server to support additional states.

Perhaps the future of MIDCARB or something like it will eventually include all U.S. states?